GIS: AREAS TOUCHED BY IT

Kaushik Dey* l Anjan Roy l S.P. Dey*****

**Officer Surveyor, Survey of India, Hyderabad, India.*

***Assistant Surveyor, Survey of India, Kolkata, West Bengal, India.*

****Ex Officer Surveyor (retired), Survey of India, Kolkata, West Bengal, India.*

DOI: http://doi.org/10.47211/idcij.2022.v09i03.003

ABSTRACT

GIS is a technology that helps to create, manage, visualize and analyze geospatial data. Research was pursued to present the different areas of life touched by GIS. The main objective of this research was to present the data, conclusions and recommendations in a manner so that it is easy to understand even for people who do not come from a related technical background. Thus, this research took an applied shape.

A study and subsequent review of related literature revealed that GIS contributes to disaster management, zoning of landslide prone areas, determination of land cover and land use, approximation of flood damage, management of natural resources, soil and wetland mapping, irrigation management and identification of volcanic hazards.

In a nut shell, the investigators' concluded that GIS is finding its utility in newer and newer domains with every passing day. They recommended using the adaptive capacity of this technology and making it more sustainable in the coming phases of time.

KEY WORDS: *GIS, areas, Geographic Information System, Disaster Management and mapping.*

ABOUT AUTHORS:

Author Mr. Kaushik Dey is Officer Surveyor at Survey of India, Hyderabad, India.

Author Mr. Anjan Roy is Assistant Surveyor at Survey of India, Kolkata, West Bengal, India.

Author Mr. S.P Dey is Ex Officer Surveyor at Survey of India, Kolkata, West Bengal, India.

INTRODUCTION

GIS or Geographic Information System is a computer system that collects, analyses, stores and disseminates geographic information which helps different agencies to facilitate informed and smooth decision making when the task faced is managing the environment. Remote sensing and GIS are principally used in the process of mapping to develop a variety of maps. Examples of such maps include land cover maps, vegetation maps, soil maps and geological maps.

GENESIS

The history of GIS started in 1854. Cholera hit the city of London, England. British physician, John Snow began mapping outbreak locations, roads, property boundaries, waterlines etc. When he added these features to a map, something interesting was revealed. He found that Cholera cases were more common along the water line. John Snow's Cholera map was a major development connecting Geography and Public Safety. Not only was this the commencement of spatial analysis, but it also marked the starting of a new field of knowledge. That field came to be known as 'Epidemiology'. Today, John Snow is known as the 'Father of Epidemiology'. He proved that GIS is a problem-solving tool.

CURRENT STATUS

Today GIS is not a standalone platform. It is a combination of Geography, Mathematics, Surveying, Cartography (the Science of drawing maps), Computer Programming, Networking, Database Management System (DBMS) and Administration. The advancement in Computer Technology has converted GIS from being a mere concept to a complete platform.

NECESSITY OF THE RESEARCH

Before the maps are developed, a plethora of data is collected with the help of remote sensing technology using ground photographs, aerial photographs or satellite photographs of the area under study. Remote sensing is the function of the satellite giving information about properties of an object from a remote location without making physical contact with it. The process entails making and recording observations on photographic films using sensors such as cameras, scanners, radars, and radiometers etc., mounted on platforms (aircrafts and satellites) at a considerable height above the earth's surface. The data is then analysed depending on the objective of the analysis.

Thus, this provides ample scope of research to explore the different areas touched by GIS.

RESEARCH METHODOLOGY

Research was pursued to present the different areas of life touched by GIS. The main objective of this research was to present the data, conclusions and recommendations in a manner so that it is easy to understand even for people who do not come from a related technical background. Thus, this research took an applied shape. It aimed at solving a problem. The problem was accessibility of technical data about the different areas touched by GIS. Hence, there have been many similar researches pursued previously also. So, this research also aimed at refining the information presented to readers who are not from a related technical background. From that standpoint, this research can also be said to have adopted a refining approach.

To sum up, this is an example of an applied research with a refining approach.

CONCLUSION

A study and subsequent review of related literature revealed that GIS is reaching many avenues and touching newer and newer areas with every passing day. A summary of that knowledge is presented below, keeping into consideration the fact that a large section of this research may people without the technical knowledge of the subject.

Disaster Management

The whole world has become prone to disasters. Disasters include both natural and manmade. GIS has helped mankind to locate disaster prone zones and forecast disasters before they appear. Thus, the world has seen introduction of a new type of map called disaster maps. Management of disasters also includes the challenges of reaching medical, administrative and other types of facilities to the people who are affected with it. This includes building of police stations, hospitals, fire stations, buildings for relocating people etc. With the usage of GIS and remote sensing technology, these have become easier. GIS has saved millions of lives in the past few decades.

Zoning of Landslides Hazard

Population explosion has become common in most parts of the world. In the past century, records of density of population have broken all records. There are countries like China, India, U.S.A., Mexico, Bangladesh, Russia and many more who have become victims of population explosion. So, land has been under pressure for a long time. This results commonly into landslides. Illegal construction has contributed heavily towards this.

GIS technology has helped mankind in making zones that are highly prone to landslides. This has ensured saving of lives and economic prosperity.

Determination of Land Cover and Land Use

GIS has helped immensely in determination of the behavioural patterns of man regarding land cover and land use. With increased urbanization in many parts of the world, land use has become a significant branch of knowledge. Already people are being made aware about the increased usage. Every passing day is experiencing a decrease in the percentage of unused land. So, it has become essential for governments and concerned bodies around the world to determine the changes in the behavioural patterns of man.

GIS also helps in determination of sudden changes in the usage of land due to reasons like natural calamities, grazing of cattle, deforestation etc.

It also highlights towards illegal penetration and settlement in areas of high altitudes and where vigilance is costly due to natural reasons mostly.

Approximation of Flood Damage

Like many other natural disasters, floods have also become common in many parts of the world. It is sometimes natural and sometimes manmade. Change of course of the river, excessive rainfall, lack of usage of technology to control the excess waters received during monsoon, financial crisis leading to lack of funds in controlling the rivers are some of the reasons for flood. When floods occur, they destroy civilization in the nearby areas. People have to be relocated, new constructions have to be built, roads and other civic amenities have to be restored, and medical facilities have to be reached to the flood affected areas. Apart from this there are also challenges relating to managing finances for flood management. Thus, GIS helps to determine the changes in the river tracks, study floods to determine flood prone zones and forecast the occurrence of floods.

Management of Natural Resources

Natural resources management is all about sustainable utilisation of available natural resources such as land, soil, water, air, minerals, forests, fisheries, wild flora and fauna, not only in the present time but for future generations as well. All these resources together constitute the ecosystem that ensures a better quality of life for human beings. Prudent and effective management of these finite resources is essential to ensure that human civilisation does not run out of their availability. GIS provides data that assists in identifying soil types in an area and delineating soil boundaries. Managing agricultural land involves maintaining fertility of land, managing crop yield, planning and practising crop rotation and maximum utilisation of water resources. Water being the resource that constitutes the higher percentage of what makes the ecosystem is very crucial for the environment. GIS is used to analyse geographic distribution of water resources in the form of ground water and water availability in sundry natural and manmade water bodies. GIS is also used in forestation, as this technology helps us to understand forest cover or area under forests and human encroachment onto protected forest areas. This information system plays an important role in forest management and decision making in forestry as a discipline. Additionally, forest cover also reduces the storm water runoff**.**

Soil Mapping

As already stated above, data provided by GIS helps to identify soil types in an area and to delineate soil boundaries. Soil mapping provides complete resource information about soils making an inventory of soil resource of an area. Specific GIS software is used to create soil database. Attribute data of soil of an area is about its depth, texture, drainage, run off, erosion, pH, salinity and alkalinity conditions etc. Spatial analysis then helps to interpret and analyse the field data. GIS can enable the integration of soil, fertility, land use, vegetation and water resource data into a map. The data helps in understanding soil suitability for various land use activities and is much needed for preventing environmental deterioration associated with misuse of land which can be due to inappropriate crops cultivation, poor farming practises resulting in depletion of soil nutrients, overgrazing of livestock, faulty irrigation, urban sprawl into the land etc. In developed countries soil map is widely used to retain nutrients in soil for maximisation of crop yield.

Wetland Mapping

Wetlands are recognised as one of the world’s most valuable natural resources as they contribute to a healthy environment, retaining water during dry periods and preserving a high and stable water table. Conversely during flooding, wetlands act to reduce flood levels and to trap suspended solids and attached nutrients. GIS and remote sensing technologies have been found greatly useful in mapping and monitoring wetland resources. For better conservation and restoration and management of wetland resources, it is valuable to know the distribution and extent of wetlands and to monitor their dynamic changes.

Irrigation Management

In most areas of the world water resources are finite and most of the viable economic development has already been achieved. Growth in population and the effects of over exploitation of available water resources including ground water extraction for cultivation of land in the face of cyclical drought conditions have resulted in serious imbalance in demand for water and its availability. In the above scenario, effective planning and management of irrigation can only be achieved by use of reliable information of spatial and temporal patterns of farmers’ water demand and on farming and irrigation practises prevalent in the area. Additionally, timely and credible assessment of use of existing water resources and of exploration for new sources is extremely necessary. GIS data on the above parameters has proved extremely helpful.

Identification of Volcanic Hazard

Volcanic catastrophes pose a very serious problem in many developing as well as developed countries. The impact of volcanic disasters has increased manifold in recent years owing to population growth and expansion of settlements into the potential volcanic hazard zone along with extension of basic supply lines (e.g., water, gas, etc.) in the area. This has exposed human life and the environment to hot avalanches, lava flows; hot particles gas clouds and flooding. In this regard, Geographical Information Systems (GIS), linked with remote sensing technology and telecom based warning systems, have emerged as the most promising tools to support the decision-making process to confront the hazard. The basic tool of volcanic Hazard identification are the Volcanic hazard maps which are visual, geospatial representation of the areas that could be impacted by various volcanic phenomena during or subsequent to an eruption. The most commonly used approach to compile the hazard map is based on the identification of areas affected by past eruptions. The basic assumption is that same type of events in future hits the same areas in the same way and with the same average frequency as in the past.

FUTURE SCOPE OF RESEARCH

This research instigates future scope of research on each of the areas mentioned in the concluding portion. It also instigates scope of research on newer avenues which can be touched by this modern-day boon.

RECOMMENDATIONS

The pivotal function of a geographic information system is to provide a visual representation of data. It is estimated that 80% of the data considered has a geospatial element of some form. GIS provides a means for that data to be stored in a database and then represented visually in a mapped format.

GIS is one of the most dynamic technologies being used by man. So, there will be periodical changes in the areas touched by it. That’s why, there is a necessity to refine this current research from time to time and at regular intervals, present them in front of scientists, researchers and readers.

REFERENCES

1. https://grindgis.com/blog/10-importance-of-gis-in-environment (Accessed on 12 March, 2022)
2. https://www.gislounge.com/gis-and-natural-resource-management/(Accessed on 15 April, 2022).
3. https://gissensing.com/gis/applications-of-gis-in-environmental-management/(Accessed on 30 April, 2022).
4. https://www.preprints.org/manuscript/201709.0058/v1(Accessed on 4 May, 2022).
5. https://www.google.com/search?client=firefox-bd&q=identification+of+volcanic+hazard+using +gis (Accessed on 13 May, 2022).